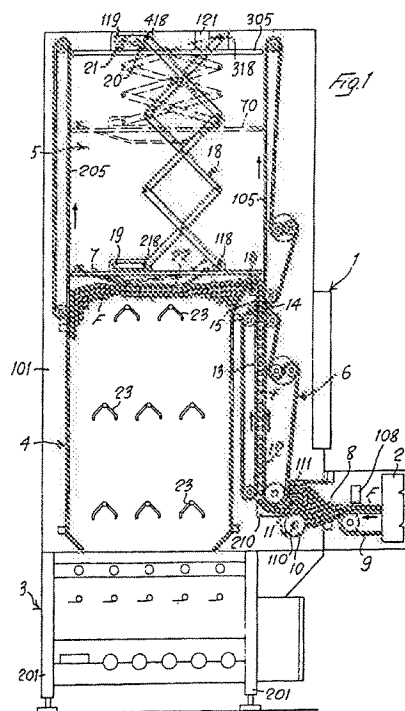


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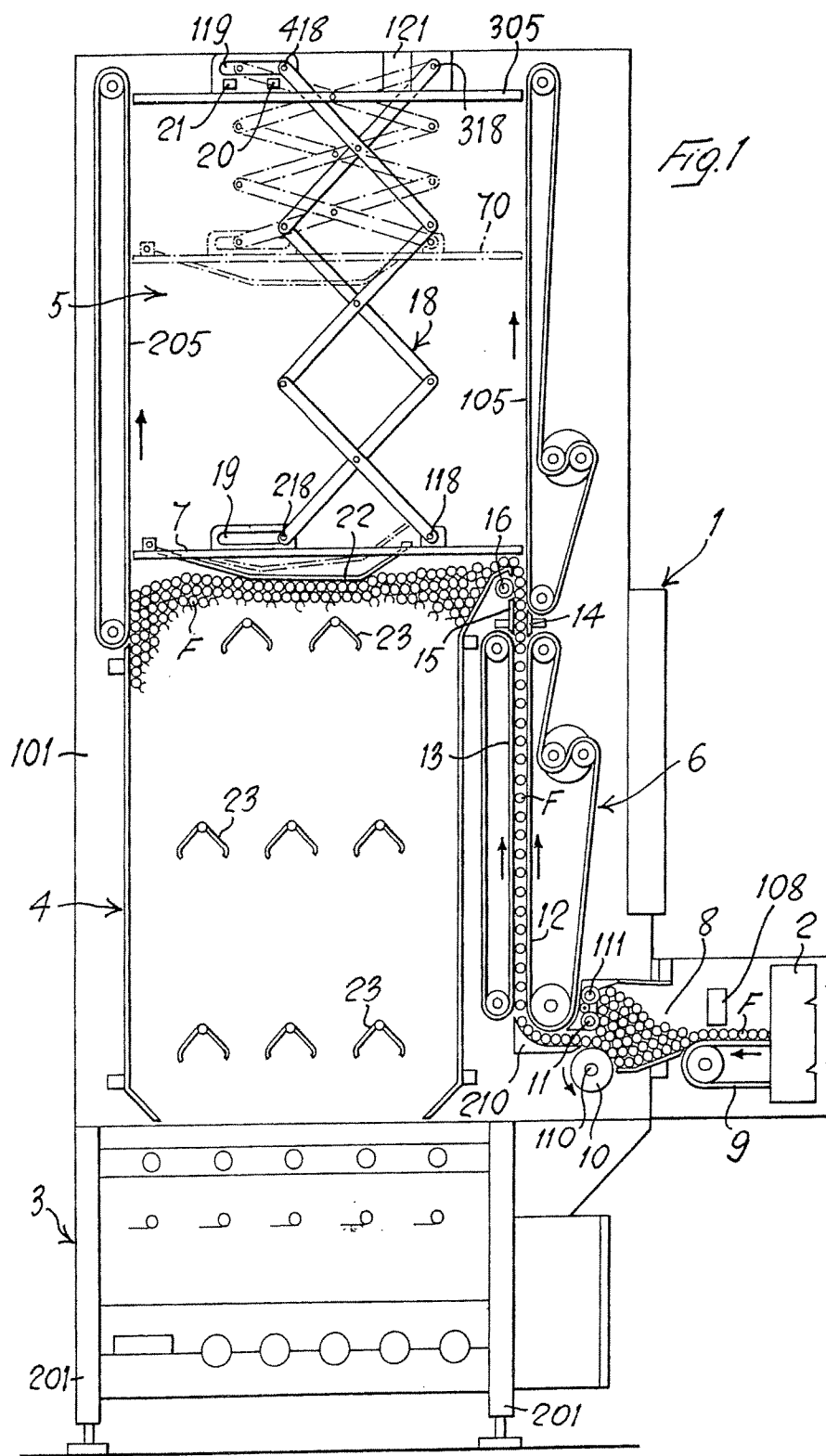
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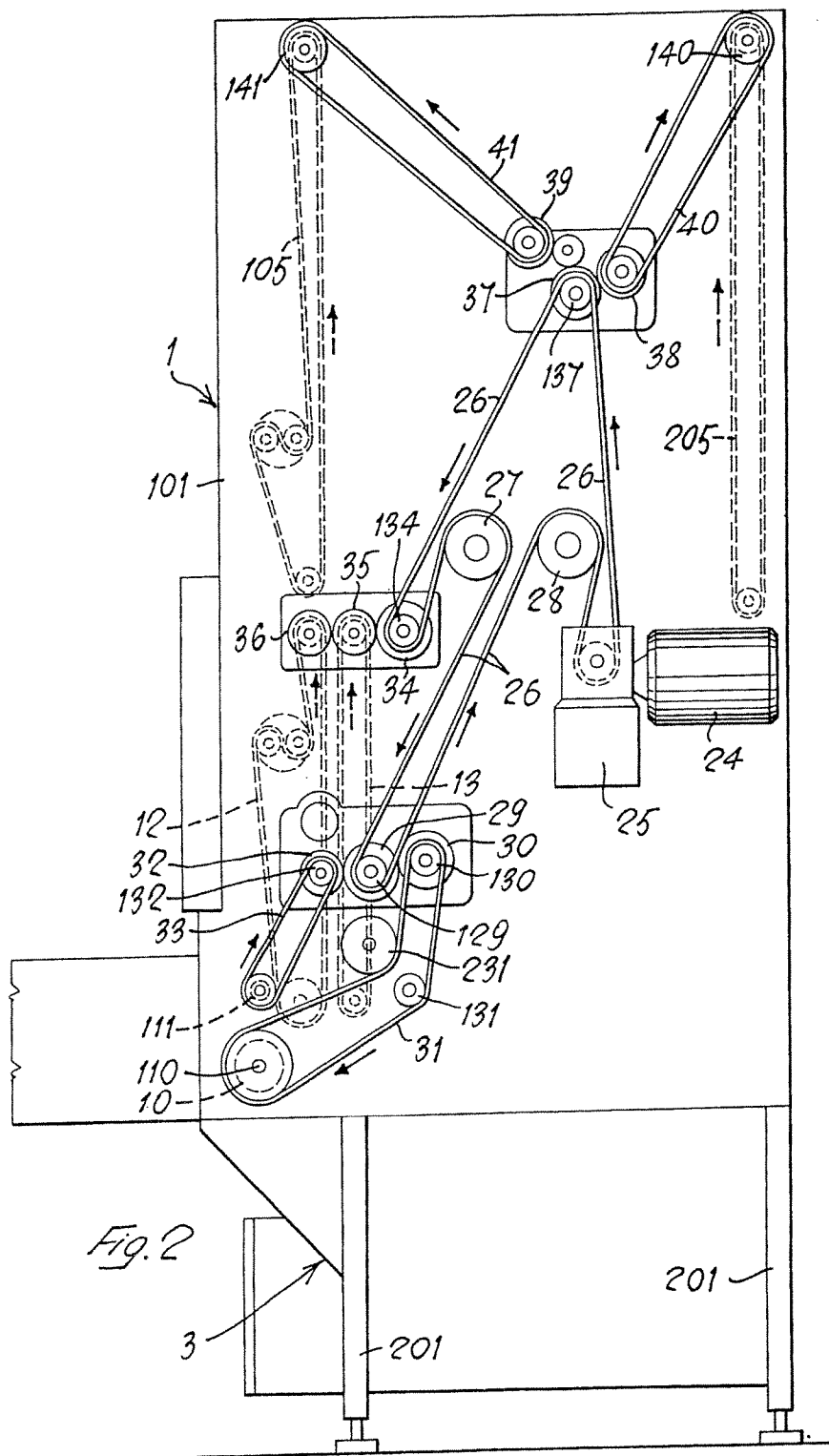
- (54) A reservoir for rod-like articles
- (57) The reservoir for rod-like articles

such as filter plugs comprises a lower hopper section 4 for the curing of the filter plugs, an overlying upper buffer section 5 in which the freshly produced filter plugs accumulate up to a predetermined maximum level, and elevator belts for feeding the freshly produced filter plugs into the reservoir in a zone which is located intermediately between the lower curing hopper and the upper buffer section. A substantially horizontal cover plate 7 is movable, at the interior of the buffer section of the reservoir, in response to the variations of the level of the filter plugs in the said buffer section. Suitable limit switches are operatively associated with the said movable cover plate, and control the operation of the filter making machine and of the delivery apparatus which receives the filter plugs from the bottom of the lower hopper section and conveys same to further processing.



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## SPECIFICATION

**A reservoir for rod-like articles**

5 The present invention relates to a reservoir used for providing a link-up between a continuous filter making machine which produces filter plugs to be used for the making of filter tip cigarettes, and a delivery and conveying apparatus which supplies  
10 the filter plugs to subsequent operations, for example to a filter tip cigarette making machine. More particularly, the reservoir according to the invention serves both for the "curing" (i.e. drying and seasoning to the best conditions of use) of the freshly made  
15 filter plugs, and for compensating (buffer action) any variation of output of the filter making machine and of demand of the delivery and conveying apparatus. Generally, the reservoir object of the present invention can be used in continuous systems which  
20 process any type of rod-like articles.

In accordance with 37 CFR 1.56 and 37 CFR 1.97, the following prior art is cited by the applicant as being of interest:

- U.S. Patent No. 3,948,276 - Figure 2;
- 25 - British Patent No. 1,175,201 - The whole document;
- British Patent No. 1,309,741 - The whole document.

As it is known, cigarette filters are made by  
30 continuous filter making machines, generally in the form of filter plugs presenting a length which is a multiple of a single filter, and are then fed, from a delivery station to another machine (usually the machine which unites the filters to the cigarettes) for  
35 subsequent processing.

The filter plugs freshly produced by a filter making machine, should be allowed to rest, before their delivery to subsequent processing, for a period of time which is required for their curing.

40 Also, it is necessary to provide for a buffer reservoir in order to compensate for any possible discrepancy between the production rate of the filter making machine and the demand rate (from the delivery apparatus) of filters for subsequent processing.  
45

The present invention contemplates a substantially vertical reservoir which comprises a lower hopper section for the curing of the filters, an overlying upper buffer section in which the freshly produced  
50 filter plugs accumulate up to a predetermined maximum level, and feed means for feeding the freshly produced filter plugs into the reservoir in a zone which is located intermediately between the lower curing hopper and the upper buffer section. A  
55 substantially horizontal cover plate is movable, at the interior of the buffer section of the reservoir, in response to the variations of the level of the filter plugs in the said buffer section. Suitable limit switches are operatively associated with the said  
60 movable cover plate, and control the operation of the filter making machine (and feed means) and of the delivery and conveying apparatus.

The construction and operation of the filter plug reservoir according to the invention will appear  
65 evident from the following description of a preferred

embodiment of same, made with reference to the attached drawings.

*Figure 1* is a diagrammatic side elevation view of the reservoir according to the invention.

70 *Figure 2* is a diagrammatic side elevation view showing the driving unit of the reservoir according to the invention.

Referring to the drawings, *Figure 1* shows a cigarette filter curing and buffer reservoir 1 which is  
75 interposed between a continuous filter making machine 2 and a delivery station 3 for feeding the filter plugs to a subsequent filter processing step.

The reservoir substantially comprises a lower hopper section 4 for the curing of the filter plugs F  
80 which through feed means 6 are fed from the filter-making machine in a continuous row into the said hopper 4, and an overlying buffer section 5 for compensating any variation of output and demand of the filter making machine and of the filter plug  
85 delivery station, respectively.

In the region of the curing hopper 4 the filter plugs F are allowed to stay for that amount of time which is sufficient for their curing, particularly for the drying or polymerization of the glue glueing together the  
90 lap seams of the paper wrappers enclosing the filter plug cores.

The buffer section 5 of the reservoir is closed by a plate 7 which bears on the upper level of the filter plugs F, and is moved up and down by the filter  
95 plugs which attain a more or less higher level in the buffer section.

The plate 7 is movably connected to the cover wall 305 of the buffer section 5 by means of a linkage 18 having a pantograph structure. This pantograph  
100 linkage 18 has its lower ends connected to plate 7 by means of a hinge 118 and a pin 218, respectively for a pivoting movement about hinge 118 and a sliding movement in guide slot 19. In a similar and corresponding manner, the upper end of linkage 18 above  
105 hinge 118 is hinged at 318, while the end above hinge 218 is slidable, by means of pin 418, in the guide slot 119.

Through the thus suspended plate 7, the level of the filter plugs in the buffer section 5 of the reservoir  
110 1 is controlled by the limit switches 20, 21, 121 which, through a suitable control circuit, decreases the output rate of the filter making machine 2 as the reservoir is filled to an intermediate level and stop the supply of the filter plus from the filter making  
115 machine 2 into the reservoir 1 when the plugs have filled the buffer section up to the predetermined highest level 70, while they cut off the outgoing delivery from the station when the level of the filter plugs is down at the predetermined minimum level, that is to say, when the plate 7 lies just above the  
120 feed means 6.

One or more wands 22 are attached to the underside of plate 7, and are curved so as to fill any gap between plate 7 and the top surface of the filter  
125 plugs.

The filter plugs are fed into the reservoir 1 assembly by feed means 6 comprising a pick-up chamber or area 8 at the lower side of the curing hopper 4. In the pick-up chamber 8 there are fed the  
130 filter plugs F, which come from the filter making

machine 2 through an endless belt 9.

In cooperation with a selecting roller 11 and a recirculating roller 111, a rotary suction drum 10 draws the accumulated filter plugs out of chamber 8.

5 Since a plurality of superposed filter plugs are attracted by suction onto drum 10, the cooperation of the rollers 11, 111 with the drum 10 is required for obtaining (roller 11) one row of single filter plugs arranged side by side and for returning into the  
10 pick-up chamber 8 (roller 111) any excess filter plug removed from drum 10 by the selecting roller 11.

A photoelectric cell 108 senses the degree of filling of pick-up chamber 8. When this area is filled with filter plugs, the photocell actuates drum 10. When  
15 the area 8 is empty, the photocell 108 stops the rotation of drum 10, while the other components of the feed means 6, including also the elevator belts 12, 13 are kept in operation for a short time, so as to allow a complete discharge into the reservoir of the  
20 filter plugs lifted between belts 12, 13.

The filter plug row drawn out of the area 8 by drum 10 is guided along the curved path 210, so as to be caught between the parallel active runs of belts 12, 13 of an endless belt elevator. The belts 12, 13 are driven  
25 with a certain difference between their respective speeds, so that the filter plugs F lifted by these belts 12, 13 are caused to roll about themselves a number of times, preferably two and a half revolutions, over the length of their upward movement. Such a rolling  
30 of the filter plugs about themselves (which is in the same direction as the rolling up of a paper wrapper enclosing the filter core of each plug) serves both for setting the plugs in good shape and for preventing the plugs from getting flattened.

35 At the end of the lifting between the upward runs of the elevator belts 12, 13, the filter plug row is taken between and guided by a pair of parallel plates 14, 15. Each one of the filter plugs leading the row is then pinched between a pinch roll 16 and a circulation belt 105 which, together with the oppositely  
40 arranged similar belt 205, defines two facing walls of the buffer section 5 in which the vertically movable plate 7 is provided. The filter plugs drawn up between pinch roll 16 and belt 105 are discharged  
45 into the hopper section 4 at the boundary between the lower hopper region 4 and the bottom of the upper buffer section 5. The side belts are positively upwardly driven with a concordant motion, so as to induce thereby the upward displacement and the  
50 circulation of the filter plugs in the buffer reservoir, and to prevent any agglomeration into a mass of the still freshly glued filter plugs.

The filter plugs are fed by gravity from the buffer section 5 to the curing hopper 4 and thence into the  
55 delivery station 3. The curing hopper 4 has substantially the shape of an open-ended box in which roof-shaped load relievers 23 are provided for relieving the load and for dividing the flow of the filter plugs through the curing region, in order to  
60 prevent any agglomeration or crushing of the plugs arriving to the delivery station 3.

Referring now to Figure 2 of the drawings, there is shown the driving unit of the reservoir 1. The driving unit is mounted on the frame 101 carried by legs 201,  
65 and serves for driving the moving parts of the

apparatus in accordance with the required operative steps and in dependence of the controls from the limit switches 20, 21 and the photoelectric cell 106.

The said driving unit is operated by the motor 24  
70 which through the associated reduction unit 25 drives the main endless belt 26, whose main guide pulleys bear the reference numerals 27 and 28, respectively. A run of belt 26 which is wound around pulley 129 drives gear 29 in rotation, which gear 29  
75 in turn causes gears 30 and 32 to be rotated at different speed ratios.

The endless belt 31 is driven by pulley 130 which is coaxially engaged to gear 30. This belt 31 is suitably guided on idler pulleys 131 and 231 and drives the  
80 shaft 110 of suction drum 10 through an electro magnetic clutch (not shown). At the same time, the endless belt 33 is driven by pulley 132 which coaxially engaged to the gear 32. Belt 33 drives the filter plug recirculating roller 111 which in turn drives  
85 the filter plug selecting roller 11 through another endless belt (not shown).

The main belt 26 passes over the pulley 134 which drives the coaxially engaged gear 34. The gear 34 drives gears 35 and 36, which in turn drive the  
90 endless belts 12 and 13 of the filter plug elevator.

The main belt 26 is also wound around a pulley 137 so as to drive in rotation a gear 37. In its turn, the gear 37 drives in rotation the gears 38 and 39, which are different in diameter and therefore have a  
95 different speed ratio. By means of the respective endless belts 40 and 41 and pulleys 140 and 141, these gears 38 and 39 drive the endless belts 105 and 205 which assist the circulating of the filter plugs in the buffer reservoir 5. The active runs of both belts  
100 105 and 205 are thus driven in the same direction but at different speeds.

It is believed that the invention will have been clearly understood from the foregoing detailed description of one preferred embodiment. Changes in  
105 the details of construction may be resorted to without departing from the spirit of the invention, and is accordingly intended that no limitation be implied and that the hereto annexed claims be given the broadest interpretation to which the employed  
110 language fairly admits.

## CLAIMS

1. A reservoir for rod-like articles, more particularly a reservoir for filter plugs providing a link-up  
115 between a continuous filter making machine and a delivery apparatus which conveys the filter plugs to subsequent processing apparatus, comprising in combination:
  - (a) a lower vertical hopper section which communicates by its discharge bottom end with the said delivery apparatus and which presents an open top end;
  - (b) an upper vertical buffer section which is  
125 directly superposed to the said hopper section and freely communicates with same at an intermediate boundary region;
  - (c) feed means for feeding a single row of rod-like articles into the reservoir, in correspondence  
130 of the said intermediate boundary region;

(d) level sensing means for sensing the level of the rod-like articles in the upper buffer section of the reservoir and for actuating control means, in response to predetermined maximum and minimum levels of the articles in the said buffer section, said control means controlling the operation of the feed means and of the delivery apparatus.

2. A reservoir according to claim 1, in which the level sensing means consist of a substantially horizontal cover plate, which rests on the top level of the articles at the interior of the buffer section of the reservoir, and is vertically movable up-and-down in response to variations of the said top level of the articles.

3. A reservoir according to claim 2, in which the cover plate presents on its lower face at least one movable wand-like member which contacts at least a part of the upper level surface of the articles and is curved with its convexity directed downwardly.

4. A reservoir according to claim 2, in which the cover plate is movably suspended at the interior of the buffer section by means of a linkage presenting a pantograph structure.

5. A reservoir according to claim 1, in which the feed means comprise a pick-up chamber or area to which the articles are fed and at the interior of which they can accumulate, a rotary suction drum for drawing the articles out of the pick-up chamber, said rotary suction drum cooperating with a selecting roller for obtaining a single row of articles aligned side-by-side, a pair of vertically disposed endless belts each having a vertical run in spaced face to face relationship with a vertical run of the other belt, providing elevator means for the articles from a lower point located approximately in correspondence of the bottom of the hopper section of the reservoir, to a higher point located approximately in correspondence of the intermediate boundary region between the buffer section and the hopper section, to deliver the said single row of articles to discharge means for discharging same into the reservoir at the said boundary region.

6. A reservoir according to claim 5, in which the belts of the said pair of endless belts are driven at different speeds, whereby the articles engaged between the facing runs of the said belts are rolled around their longitudinal axis while being elevated.

7. A reservoir according to claim 5, in which the discharge means for discharging the articles in the reservoir, comprise a pair of parallel spaced-apart plates, between which the single row of articles is fed, a pinch roller arranged in correspondence of the exit side of one of said plates, and a sidewall belt arranged in correspondence of the exit side of the other plate, the said pinch roller and the said sidewall belt being driven so as to lead and discharge the articles at the interior of the reservoir, the said sidewall belt constituting a sidewall of the upper buffer section of the reservoir.

8. A reservoir according to claim 1, in which the upper vertical buffer section presents two opposed sidewalls consisting of a pair of vertically disposed endless belts which are driven in such a manner that the inner runs of said belts move upwardly.

9. A reservoir according to claim 8, in which the

vertical sidewall endless belts are driven at different speeds.

10. A reservoir according to claim 1, in which roof-shaped load relievers are arranged at the interior of the lower hopper section of the reservoir.

11. A reservoir for rod-like articles substantially as described with reference to the accompanying drawings.

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